FL SWITCH SFN ...

Five and Eight Port Standard Function Ethernet Switches with Narrow Housings – Gigabit as an Option

AUTOMATIONWORX

Data Sheet
7267_en_01

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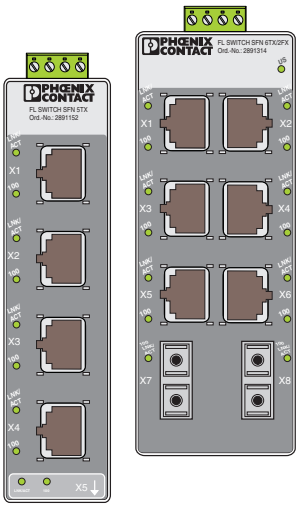


Description

The FL SWITCH SFN ... range of Factory Line switches with standard functions in numerous versions can be used for quick and cost-effective Ethernet network expansion to the field level. Due to their narrow housing design, the components are suitable for universal remote use in control cabinets and junction boxes. The switches have five or eight ports, up to two of which are glass fiber ports provided in SC or ST format. The switches support the auto negotiation function at the twisted pair ports and offer transmission speeds of 10/100/1000 Mbps depending on the switch version. Mixed operation for the connection of segments with different data transmission speeds is also supported. The glass fiber ports only support 100 Mbps or 1000 Mbps (Gigabit version).

The RJ45 ports offer an auto crossing function, which means it is not necessary to make a distinction between 1:1 and crossover cables.

The fiber optic ports can be used to extend the segment length up to 20 km. Unused RJ45 ports can be fitted with security caps to provide mechanical protection against unauthorized use.

Features and Fields of Application

– Increased network performance
  - Switched Ethernet reduces traffic and non predictable timing
  - Quality of Service: Pretagged high priority messages are forwarded before lower priority messages during periods of high network traffic loading
  - Gigabit options for data intensive applications
– Easy network expansion
  - No configuration of the switch
  - Autonegotiation and autocross simplify cabeling
  - Coupling copper network segments with different bit rates with automatic detection of the data transmission speed of 10 Mbps, 100 Mbps or 1000 Mbps depending on the switch version.
– Fiber optic options extend distance and electrical noise immunity
  - 1 or 2 ports option
  - SC or ST connector options
  - Multimode or singlemode option

Low cost, low complexity security (optional)
- Connect Layer 1 security elements at the RJ45 port to restrict access or tampering
- No software setup needed

Please note the different connection directions of the transmission media for **five-port switches**: copper cables are connected at the **front**, glass fiber cables at the **bottom**.

Make sure you always use the latest documentation.
It can be downloaded at www.download.phoenixcontact.com.

A conversion table is available on the Internet at
www.download.phoenixcontact.com/general/7000_en_00.pdf.

This data sheet is valid for all products listed on the following page:

Ordering Data

Ethernet Switches with 10/100 Mbps

Description	Type	Order No.	Pcs./Pkt.
Ethernet switch with 5 RJ45 ports for 10/100 Mbps	FL SWITCH SFN 5TX	2891152	1
Ethernet switch with 4 RJ45 ports and 1 fiber optic port in **SC format** for 10/100 Mbps	FL SWITCH SFN 4TX/FX	2891851	1
Ethernet switch with 4 RJ45 ports and 1 fiber optic port in **ST format** for 10/100 Mbps	FL SWITCH SFN 4TX/FX ST	2891453	1
Ethernet switch with 8 RJ45 ports for 10/100 Mbps	FL SWITCH SFN 8TX	2891929	1
Ethernet switch with 7 RJ45 ports and 1 fiber optic port in **SC format** for 10/100 Mbps	FL SWITCH SFN 7TX/FX	2891097	1
Ethernet switch with 7 RJ45 ports and 1 fiber optic port in **ST format** for 10/100 Mbps	FL SWITCH SFN 7TX/FX ST	2891110	1
Ethernet switch with 6 RJ45 ports and 2 fiber optic ports in **SC format**	FL SWITCH SFN 6TX/2FX	2891314	1
Ethernet switch with 6 RJ45 ports and 2 fiber optic ports in **ST format** for 10/100 Mbps	FL SWITCH SFN 6TX/2FX ST	2891411	1

Ethernet Switches with 10/100/1000 Mbps (Gigabit)

Description	Type	Order No.	Pcs./Pkt.
Ethernet switch with 8 RJ45 ports for 10/100/**1000** Mbps	FL SWITCH SFN 8GT	2891673	1
Ethernet switch with 7 RJ45 ports for 10/100/**1000** Mbps and 1 fiber optic port in SC format (multi-mode), 850 nm up to 550 m distance	FL SWITCH SFN 7GT/SX	2891518	1
Ethernet switch with 6 RJ45 ports for 10/100/**1000** Mbps and 2 fiber optic ports in SC format (multi-mode), 850 nm up to 550 m distance	FL SWITCH SFN 6GT/2SX	2891398	1
Ethernet switch with 6 RJ45 ports for 10/100/**1000** Mbps and 2 fiber optic ports in SC format (single mode), 1310 nm up to 10 km distance	FL SWITCH SFN 6GT/2LX	2891987	1
Ethernet switch with 6 RJ45 ports for 10/100/**1000** Mbps and 2 fiber optic ports in SC format (single mode), 1310 nm up to 20 km distance	FL SWITCH SFN 6GT/2LX-20	2891563	1

Accessories

Description	Type	Order No.	Pcs./Pkt
Universal end clamp	E/NS 35 N	0800886	50
Dust protection caps for RJ45 female connectors	FL RJ45 PROTECT CAP	2832991	10
Security set for 4 RJ45 ports	FL SEC PAC 4TX	2832865	4
Patch angle with 2 ports in CAT 5e	FL PF 2TX CAT5E	2891165	1
Patch angle with 8 ports in CAT 5e	FL PF 8TX CAT5E	2891178	1
Patch angle with 2 ports in CAT 6	FL PF 2TX CAT6	2891068	1
Patch angle with 8 ports in CAT 6	FL PF 8TX CAT6	2891071	1
Patch angle with security elements for 2 ports in CAT 5e	FL PF SEC 2TX	2832687	1
Patch angle with security elements for 8 ports in CAT 5e	FL PF SEC 8TX	2832690	1
Patchbox 8 x RJ45 CAT 5e, pre-assembled, can be retrofitted	FL PBX 8TX	2832496	1
Patchbox 6 x RJ45 CAT 5e and 4 SC-RJ, glass pre-assembled, can be retrofitted	FL PBX 6TX/4FX	2832506	1
Patch cable, CAT 5, pre-assembled, 0.3 m long	FL CAT5 PATCH 0,3	2832250	10
Patch cable, CAT 5, pre-assembled, 0.5 m long	FL CAT5 PATCH 0,5	2832263	10
Patch cable, CAT 5, pre-assembled, 1.0 m long	FL CAT5 PATCH 1,0	2832276	10
Patch cable, CAT 5, pre-assembled, 1.5 m long	FL CAT5 PATCH 1,5	2832221	10
Patch cable, CAT 5, pre-assembled, 2.0 m long	FL CAT5 PATCH 2,0	2832289	10
Patch cable, CAT 5, pre-assembled, 3.0 m long	FL CAT5 PATCH 3,0	2832292	10
Patch cable, CAT 5, pre-assembled, 5.0 m long	FL CAT5 PATCH 5,0	2832580	10
Patch cable, CAT 5, pre-assembled, 7.5 m long	FL CAT5 PATCH 7,5	2832616	10
Patch cable, CAT 5, pre-assembled, 10.0 m long	FL CAT5 PATCH 10	2832629	10

Technical Data

General Data	
Function	Switch/repeater; conforms to standard IEEE 802.3
Latency of the communication processor	8 µs plus frame time
Housing dimensions (width x height x depth) in mm	
5-port switch (RJ45)	30 x 120 x 70 (without COMBICON/without fiber optics)
8-port switch (RJ45)	50 x 120 x 70 (without COMBICON/without fiber optics)
Operating temperature (10/100 Mbit/s switch) and FL SWITCH SFN 6GT/2LX-20	0°C to 60°C
Operating temperature (10/100/1000 Mbit/s switch), not FL SWITCH SFN 6GT/2LX-20	-25°C to 60°C
Storage temperature (10/100 Mbit/s switch) and FL SWITCH SFN 6GT/2LX-20	-20°C to 70°C
Operating temperature (10/100/1000 Mbit/s switch), not FL SWITCH SFN 6GT/2LX-20	-35°C to 85°C
Degree of protection	IP20, DIN 40050, IEC 60529
Protection class	Class 3 VDE 0106; IEC 60536
Humidity (operation and storage)	10% to 95%, no condensation
Air pressure (operation)	86 kPa to 108 kPa, 1500 m above sea level
Air pressure (storage)	66 kPa to 108 kPa, 3500 m above sea level
Preferred mounting position	Perpendicular to a standard DIN rail
Connection to protective earth ground	Snapped onto a grounded DIN rail
Weight	
5-port switch	265 g, approximately
8-port switch	440 g, approximately

Supply Voltage (US)	
Connection	Via COMBICON; conductor cross section = 2.5 mm^2, maximum
Nominal value (10/100 Mbit/s switch)	24 V DC
Nominal value (10/100/1000 Mbit/s switch)	12 V DC to 24V DC
Permissible ripple	3.6 V_{pp} within the permissible voltage range
Permissible voltage range (10/100 Mbit/s switch)	18.5 V DC to 30.2 V DC
Permissible voltage range (10/100/1000 Mbit/s switch)	9 V DC to 30.2 V DC
Inrush current	Depends on the device - see the following table
Test voltage	500 V DC for one minute
Protection against polarity reversal	Present
Current consumption	Depends on the device - see the following table

Current Consumption and Inrush Current

	Current Consumption (max)	Power up Inrush Current
FL SWITCH SFN 5TX	90 mA (24 V DC)	2.3 A for 3 ms
FL SWITCH SFN 4TX/FX	140 mA (24 V DC)	2.4 A for 2 ms
FL SWITCH SFN 4TX/FX ST	140 mA (24 V DC)	2.9 A for 2 ms
FL SWITCH SFN 8TX	140 mA (24 V DC)	3.1 A for 2 ms
FL SWITCH SFN 7TX/FX	190 mA (24 V DC)	3.4 A for 2 ms
FL SWITCH SFN 7TX/FX ST	190 mA (24 V DC)	3.4 A for 2 ms
FL SWITCH SFN 6TX/2FX	230 mA (24 V DC)	3.6 A for 2 ms
FL SWITCH SFN 6TX/2FX ST	230 mA (24 V DC)	3.3 A for 2 ms
FL SWITCH SFN 8GT	430 mA (24 V DC) / 1010 mA (9 V DC)	3.1 A for 3 ms
FL SWITCH SFN 7GT/SX	320 mA (24 V DC) / 900 mA (9 V DC)	4.2 A for 3 ms
FL SWITCH SFN 6GT/2SX	350 mA (24 V DC) / 960 mA (9 V DC)	4.4 A for 3 ms
FL SWITCH SFN 6GT/2LX	360 mA (24 V DC) / 950 mA (9 V DC)	4.4 A for 3 ms
FL SWITCH SFN 6GT/2LX-20	360 mA (24 V DC) / 990 mA (9 V DC)	4.4 A for 3 ms

Interfaces

Total number of Ethernet interfaces	5/8
Mac Address Table Size (Entries)	1 K (4, 5, 8 TX versions), 8 K (all others)
Properties of RJ45 Ports	
Number	4, 5, 6, 7 or 8 depending on the device version
Connection format	8-pos. RJ45 female connector on the switch
Connection medium	Twisted pair cable with a conductor cross section of 0.14 mm^2 to 0.22 mm^2
Cable impedance	100 ohms
Transmission speed	10/100 Mbps or 10/10/1000 Mbps
Maximum network segment expansion	100 m
General Properties of Fiber Optic Ports	
Number	0, 1 or 2 depending on the device version
Connection format 100 Mbit/s	SC duplex or ST female connector on the switch
Connection format 1000 Mbit/s	SC duplex connector on the switch
Laser protection	Class 1 according to DIN EN 60825-1:2001-11
Properties of 100 Mbit/s Multimode	
Transmission rate	100 Mbit/s Full duplex
Wavelength	1300/1310 nm
Max. transmission length	2 km Fiber optic 50/125 2 km Fiber optic 62.5/125
Transmission power (Medium type) dynamic (average)	
Minimum	-23.5 dBm (50/125 µm) / -20 dBm (62.5/125 µm)
Maximum	-14 dBm (50/125 µm) / -14 dBm (62.5/125 µm)
Transmission power (Medium type) static	
Minimum	-22.5 dBm (50/125 µm) / -19 dBm (62.5/125 µm)
Maximum	-14 dBm (50/125 µm) / -14 dBm (62.5/125 µm)
Receiver sensitivity	
Minimum	-31 dBm (dynamic) / -31 dBm (static)
Maximum	-14 dBm (dynamic) / -14 dBm (static)
Properties of 1000 Mbit/s Multimode	
Transmission rate	1.25 Gbit/s Full duplex
Wavelength	850 nm
Max. transmission length	260 m Fiber optic 50/125 550 m Fiber optic 62.5/125
Transmission power	
Minimum	-9.5 dBm
Maximum	-4 dBm
Receiver sensitivity	
Minimum	-17 dBm
Maximum	-3 dBm
Properties of 1000 Mbit/s Singlemode	
Transmission rate	1.25 Gbit/s Full duplex
Wavelength	1310 nm
Max. transmission length FL SWITCH 6GT/2LX Max. transmission length FL SWITCH 6GT/2LX-20	10 km Fiber optic 9/125 20 km Fiber optic 9/125
Transmission power	
Minimum	-10 dBm
Maximum	-3 dBm
Receiver sensitivity	
Minimum	-0 dBm
Maximum	-20 dBm

Interfaces (Continued)

Alarm Contact for Gigabit Version	
Voltage	24 V DC, typical
Current carrying capacity	100 mA maximum including inrush

Mechanical Tests

Shock test according to IEC 60068-2-27	Operation: 25g, 11 ms period, half-sine shock pulse Storage/transport: 50g, 11 ms period, half-sine shock pulse
Vibration resistance according to IEC 60068-2-6	Operation/storage/transport: 5g, 150 Hz, Criterion 3
Free fall according to IEC 60068-2-32	1 m

Conformance With EMC Directives

Developed according to IEC 61000-6-2	
IEC 61000-4-2 (ESD)	Criterion B
IEC 61000-4-3 (radiated-noise immunity)	Criterion A
IEC 61000-4-4 (burst)	Criterion A
IEC 61000-4-5 (surge)	Criterion B
IEC 61000-4-6 (conducted noise immunity)	Criterion A
IEC 61000-4-8 (noise immunity against magnetic fields)	Criterion A
EN 55022 (noise emission)	Class A

Approvals

10/100 Mbit/s switch	CE, cURUS, ROHS EEE 2002/95/EC, WEEE 2002/96/EC, UL 1604 hazardous locations: Class I, Division 2, Groups A, B, C, D; Temp Code T5; 0C< T_{amb} < 60C, Installed in minimum IP54 enclosure
10/100/1000 Mbit/s switch	CE, cURUS, ROHS EEE 2002/95/EC, WEEE 2002/96/EC, UL 1604 hazardous locations: In preparation

Differences Compared to Previous Versions

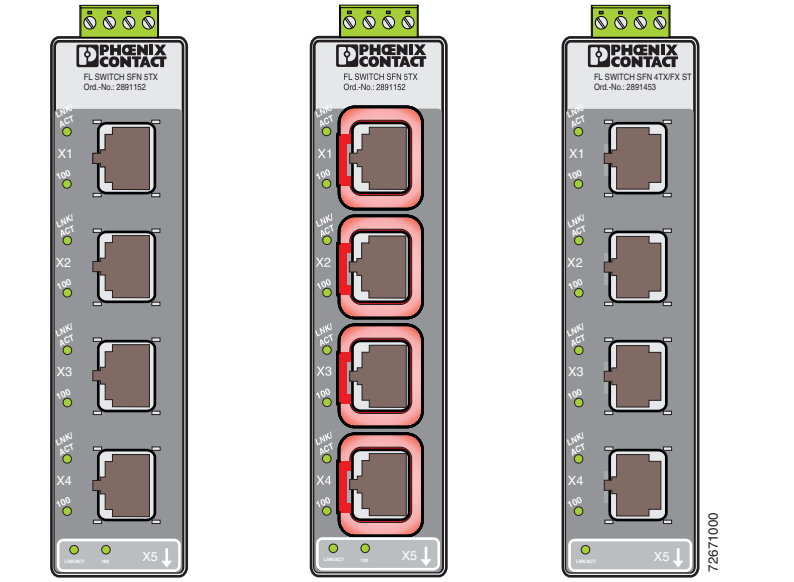
Version 00 - First version

Version 01 - Update Gigabit, supply voltage, current consumption, surge and approvals

Housing Versions and Position of the Fiber Optic Connections

5 Port Versions

The housings of the 5-port versions are identical. Port 5 is located at the **bottom**.



FL SWITCH SFN 5TX **FL SWITCH SFN 4TX/FX ST**

FL SWITCH SFN 5TX with FL SEC PAC

Figure 1 Housing example for 5-port switches

8 Port Versions

The housings of the 8-port versions are identical. On the fiber optic versions, the connections for the fiber optic ports are at the **front**. The physical location of the ports on the 10/100 and 10/100/1000 (Gigabit) switches are the same.

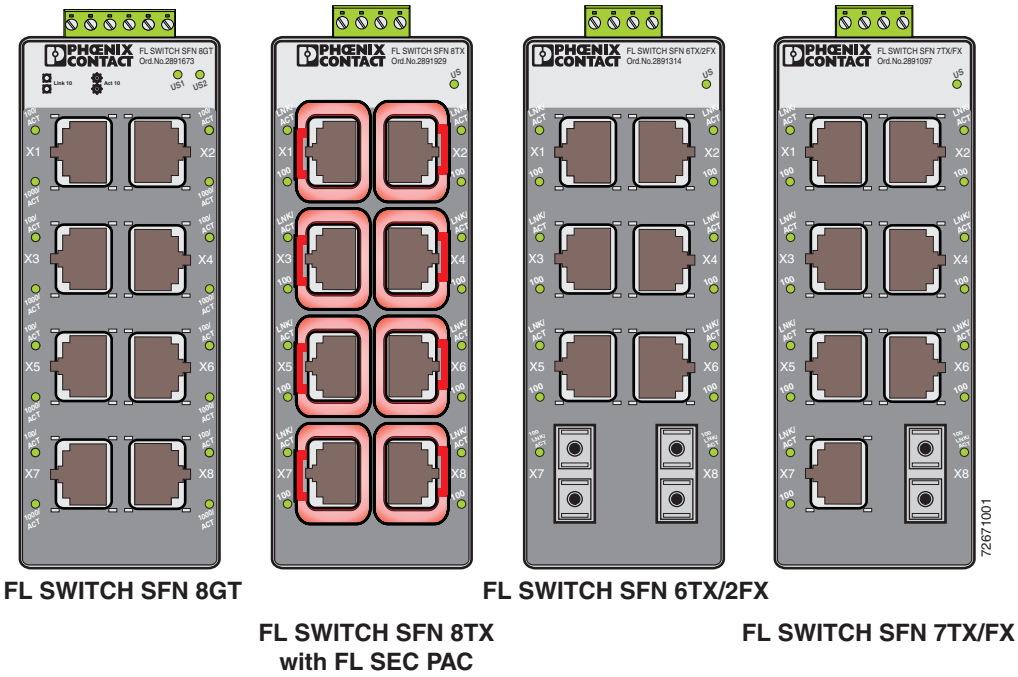


Figure 2 Housing example for 8-port switches

Local Diagnostic and Status Indicators for 10/100 or 10/100/1000 Mbps Versions

Des.	Color	Status	Meaning
US or US1/2	Green	ON	Supply voltage US in the tolerance range
		OFF	Supply voltage US too low

LEDs on 10/100 Mbps Versions for the Data Transmission Speed (2 LEDs/Port)

	10 Mbps	100 Mbps
LNK/ACT	ON/blinking	ON/blinking
100	OFF	ON

LNK/ACT LED:

ON: indicates an electrical Link

Blinking: indicates network traffic (at high data rates the blinking is in a constant rate)

LEDs on 10/100/1000 Mbps Versions for the Data Transmission Speed (2 LEDs/Port)

	10 Mbps	100 Mbps	1000 Mbps
100/ACT	ON/blinking	ON/blinking	OFF
1000/ACT	ON/blinking	OFF	ON/blinking

One LED/port ON or blinking:

ON: indicates an electrical Link

Blinking: indicates network traffic at the data rate (x Mbit/s)

Both LEDs/port ON or blinking:

Both ON: indicates a 10 Mbit/s electrical Link

Both Blinking: indicates 10 Mbit/s network traffic

General Information

Warning
Disregarding this warning may result in damage to equipment and/or serious personal injury. Only qualified personnel may start up and operate these devices. According to the safety instructions in this text, qualified personnel are persons who are authorized to start up, to ground, and to mark devices, systems, and equipment according to the standards of safety technology. In addition, these persons must be familiar with all warning instructions and maintenance measures in this text.

Warning
The FL SWITCH SFN ... module is designed exclusively for SELV operation according to IEC 950/EN 60950/VDE 0805.

Using the FL SEC PAC Kit for Port Security

Layer 1 Port security for up to 4 ports, is provided by purchasing the FL SEC PAC kit. The kit contains 4 red security frames, 4 grey port blocking security caps, unlocking key and instructions. The red security frame must first be attached to each port that is to be secured.

– First orient the red security frame, so that the cable locking tabs of both the frame and the switch are aligned.
– Then, insert the 4 mounting feet of the security frame into the pre-punched holes around the switch port and push until the frame snaps into place with an audible click.

Once attached, the security frames are permanently mounted and can not be removed.

Inserted cables or grey port blocking security caps will now be locked into place. Instructions for using the key to unlock the cables or security caps are included in the kit.

Installation and Assembly/Removal

Install the FL SWITCH SFN ... on a clean DIN rail. To avoid contact resistance only use clean, corrosion-free DIN rails. End clamps can be mounted on both sides of the module to stop the modules from slipping on the DIN rail.

Connect the DIN rail to protective earth ground using a grounding terminal block. The modules are grounded when they are snapped onto the DIN rail. Connect protective earth ground with low impedance. Gigabit components have a functional earth ground connecting screw on the top.

Assembly:

1. Place the module onto the DIN rail from above. The upper holding keyway must be hooked onto the top edge of the DIN rail.
2. Push the module from the front towards the mounting surface.
3. Once the module has been snapped on properly, check that it is fixed securely on the DIN rail.

Removal:

1. Insert a suitable tool (e.g., needle-nose pliers) into the arresting latch and pull it down.
2. Pull the module slightly away from the mounting surface.
3. Lift the module from the DIN rail.

Terminal Assignment for 10/100 Mbps Versions

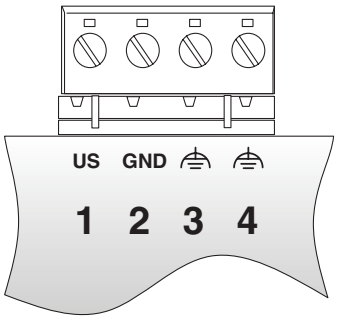


Figure 3 Terminal assignment

Terminal	Meaning
1	Supply voltage +US
2	GND US
3	Functional earth ground
4	Functional earth ground

Terminal Assignment for 10/100/1000 Mbps Versions

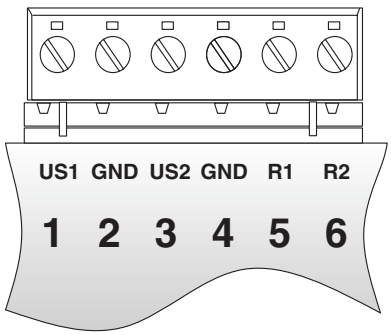


Figure 4 Terminal assignment

Terminal	Meaning
1	Supply voltage +US 1
2	GND US 1
3	Supply voltage +US 2
4	GND US 2
5	Alarm contact R1
6	Alarm contact R2

Supply Voltage Connection and Grounding for 10/100 Mbps Versions

Supply Voltage

The switch is designed for SELV operation at +24 V DC according to IEC 950/EN 60950/VDE 0805. Only SELV according to the defined standards may be used for supply purposes.

Connection to Functional Earth Ground

Snapping the switch onto a grounded DIN rail connects it to the ground potential. In an environment particularly prone to EMI, noise immunity can be increased by an additional low-impedance connection to functional earth ground via terminal 3 or 4.

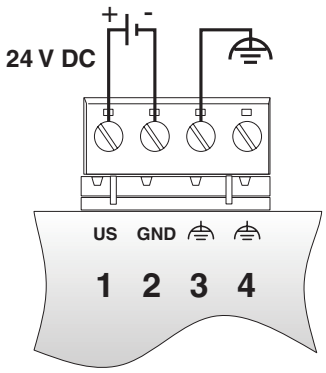


Figure 5 Example for supply of a 10/100 Mbps module

Supply Voltage Connection and Grounding for 10/100/1000 Mbps Versions

Supply Voltage

The switch is designed for SELV operation at 24 V DC according to IEC 950/EN 60950/VDE 0805. Only SELV according to the defined standards may be used for supply purposes.

Operate the module using a +24 V DC SELV. The module is fully operational even with only one supply voltage (without jumpering it to other supply voltage terminal blocks) and/or without wiring the alarm contact (see Figure 6, A).

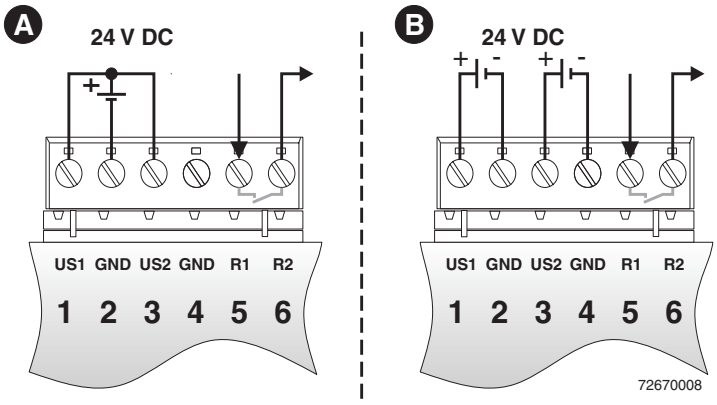


Figure 6 Supply of a 10/100/1000 Mbps module from one or two voltage sources

Alarm Contact Operation

– One or more power supplies failed -> the contact closes
– Power OK -> the contact opens

The maximum current, include inrush, is 100 mA.

Connection to Functional Earth Ground

Snapping the switch onto a grounded DIN rail connects it to the ground potential. In an environment particularly prone to EMI, the switch can be grounded by an additional low-impedance connection to functional earth ground via an eyelet ring on the upper part of the housing.

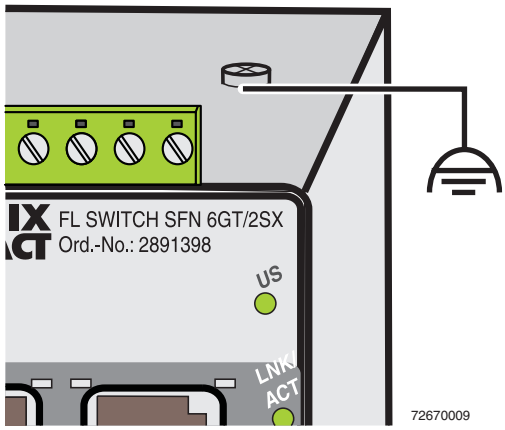


Figure 7 Grounding via an eyelet ring

Ethernet Interface

The FL SWITCH SFN ... has up to 8 Ethernet ports on the front in RJ45 format, to which only twisted pair cables with an impedance of 100 Ω can be connected. The data transmission speed is 10 Mbps/100 Mbps or 10 Mbps/100 Mbps/1000 Mbps. In addition, every port has an auto crossing function: it is not necessary to make a distinction between 1:1 or crossover Ethernet cables.

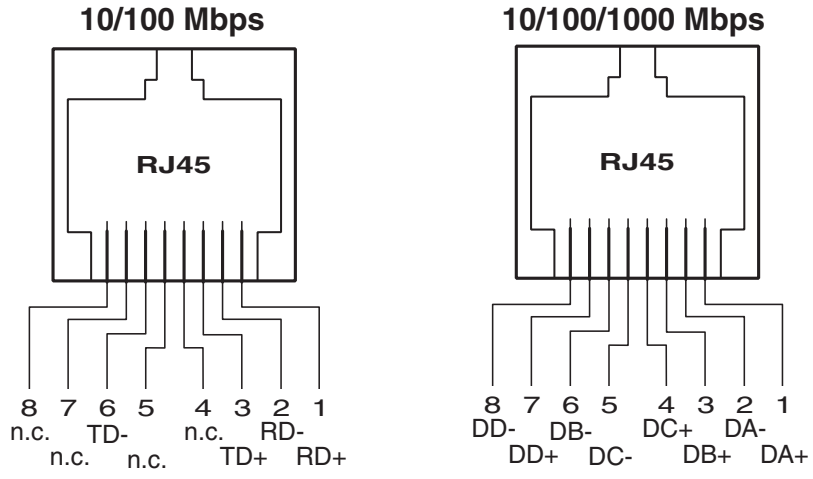


Figure 8 Pin assignment of the Ethernet ports in RJ45 format

Switching Characteristics of the FL SWITCH SFN ...

– **Store and Forward**
All data telegrams that are received by the switch are saved and their validity checked. Invalid or faulty data packets (> 1522 bytes or CRC errors) and fragments (< 64 bytes) are rejected. Valid data telegrams are forwarded by the switch. The switch always forwards the data using the data transmission speed that is used in the destination network segment.

– **Multi-Address Function**
The switch independently learns the addresses for termination devices, which are connected via a port, by evaluating the source addresses in the data telegrams. Only packets with unknown addresses, with a source address of this port or with a multicast/broadcast address in the destination address field are forwarded via the corresponding port. The switch can store addresses in its address table with an aging time of 5 minutes. This is important when more than one termination device is connected to one or more ports. In this way, several independent subnetworks can be connected to one switch.

– **Quality of Service (QoS): IEEE 802.1P/Q**
The SFN switches are capable of reading Ethernet packets that have already been assignent a priority level by a managed switch or other. In cases of heavy traffic, packets with a priority 4-7 are considered high priority and processed before packets with 0-3 priority level. After prioritization the packets are forwarded without modification.

A restart deletes the entire address table.

Housing Dimensions

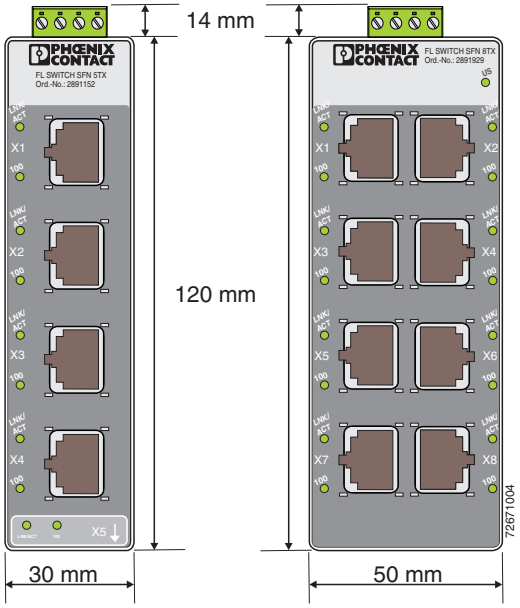


Figure 9 Housing dimensions for the FL SWITCH SFN ...

The housing depth is 70 mm for all housing versions.

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